THE EFFECTS OF CHANGES IN THE COMPOSITION OF EMPLOYMENT ON EURO AREA WAGE GROWTH: PANEL DATA ANALYSIS

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(*) The opinions and analyses in this paper are the author's sole responsibility and, therefore, do not necessarily coincide with those of the Banco de España or the Eurosystem.
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Abstract

In the euro area, the composition of employment has changed significantly since the onset of the financial crisis, particularly in terms of employees' age and educational level, in addition to the incidence of temporary contracts. This paper exploits two new panel datasets to estimate the extent to which changes in the composition of employment were behind weak wage growth in the euro area and in its main member countries during the economic recovery following the financial crisis. This type of analysis, which follows the same individual over several periods of time, allows the effect of individual productivity to be treated econometrically and certain biases that could affect the use of cross-sectional data to be avoided. It is concluded that changes in the composition of employment had some positive effect on wages in the euro area between 2010 and 2012. However, from 2013 until 2017, the last period for which microdata are available, this effect turned negative and increased in magnitude, dampening aggregate wage growth. In the last two years the effect was particularly significant, with an impact of around 1 percentage point. Correcting for the effect of changes in the composition of employment on wages leads to a closer relationship between wages and cyclical conditions.

Keywords: compositional effects, panel data, individual fixed effects.

JEL classification: E24, J31.

Resumen

En la zona del euro, la composición del empleo experimentó variaciones significativas desde el comienzo de la crisis financiera, particularmente en lo referente a la edad y al nivel educativo de los asalariados, así como en la incidencia de la contratación temporal. En este trabajo se explotan dos nuevos conjuntos de datos de panel para estimar en qué medida los cambios en la composición del empleo desempeñaron un papel importante a la hora de explicar el débil crecimiento de los salarios en el conjunto de la zona del euro y en sus principales países miembros durante la etapa de recuperación económica que siguió a la crisis financiera. Este tipo de análisis, en el que se sigue al mismo individuo durante varios períodos de tiempo, permite tratar econométricamente el efecto de la productividad individual, así como evitar determinados sesgos que podrían afectar al uso de datos de sección cruzada. Se concluye que los cambios en la composición del empleo ejercieron cierto efecto positivo sobre los salarios en la zona del euro entre 2010 y 2012. Sin embargo, a partir de 2013 y hasta 2017, último período para el que se dispone de datos individuales, este efecto cambió de signo y aumentó de magnitud, amortiguando el crecimiento de los salarios agregados. En los dos últimos años analizados, el efecto fue particularmente relevante, situándose su impacto en el entorno de 1 punto porcentual. La corrección del efecto de los cambios de composición en el empleo sobre los salarios permite obtener una relación más estrecha entre estos y las condiciones cíclicas.

Palabras clave: efectos de composición, datos de panel, efectos fijos individuales.

Códigos JEL: E24, J31.

Contents

1 Introduction

Weak euro area wage growth during the economic recovery has aroused many analysts' interest. It has been attributed largely to cyclical factors, such as a higher incidence of part-time contracts and low inflation expectations, together with other, more structural factors related to the secular trend of subdued productivity growth, demographic and technological changes and institutional reforms of the labour markets (see Nickel et al. (2019)). Furthermore, analysis of labour costs and their relationship to the economic cycle must take into consideration that shifts in the composition of employment may have significant effects on aggregate wages for the whole economy. Thus, although this paper only covers up to 2017 due to microdata availability, analysis of the compositional effects is particularly relevant in the current context of the pandemic, given that substantial shifts in the composition of employment impacting aggregate wage growth are also to be expected.

In the euro area, the composition of employment has undergone significant changes since the onset of the financial crisis, as the share of younger, less educated workers with higher job temporariness and lower wages decreased. The sectoral composition of employment and the share of employees working in the higher and lower-paying sectors of the economy have also changed substantially. These compositional effects may be heavily influenced by the economic cycle, pushing up wage growth in a downturn or depressing wage growth in an upturn. Indeed, according to the literature, changes in the composition of employment may trigger this countercyclical effect on aggregate wages,[1] and several papers, referring above all to the years of the Great Recession, have found empirical evidence in this connection for several countries.[2]

Kouvavas et al. (2019), based on research conducted by a group of Eurosystem labour market experts (see Nickel et al. (2019)), analyse the compositional effects on wage growth in the euro area and euro area member countries using cross-sectional microdata from the European Union Statistics on Income and Living Conditions (EU-SILC). Their findings show that compositional effects boosted wage growth at the onset of the financial crisis, driving it up annually by more than one percentage point (pp) on average over the 2008-2010 three-year period. However, since then the effects have diminished, changing sign in 2015 and 2016 and subtracting between 0.2 and 0.5 pp from wage growth. The countercyclical pattern of the compositional effects resulted mainly from the group of young and comparatively low-skilled workers with relatively low wages. This group was hit especially hard by job losses early in the crisis (pushing average wage growth up during the downturn) and only experienced higher re-employment probability during the recovery period (with a downward effect on average wage growth). These aggregate results for the euro area were influenced, above all, by developments in Spain and Italy.

However, the findings obtained drawing on cross-sectional data could be biased due to omitted variables or selection problems. These can be treated econometrically using panel

1 See, for example, Stockman (1983), Bils (1985), Keane et al. (1988) and Solon et al. (1994).

2 For example, Puente and Galán (2014) for Spain, D'Amuri (2014) for Italy and De Sloover and Saks (2018) for Belgium.

data.[3] Christodoulopoulou and Kouvavas (2019) state that using repeated cross-sectional data they were only able to correct wages for changes in observable characteristics, such as educational attainment level, experience, age, gender and nationality, whereas with panel data they were also able to control for changes in the unobservable individual productivity component.[4] Panel data recently became available for Germany. Specifically, the EU-SILC clone built on the Socio-Economic Panel (SOEP)[5] and the longitudinal data in the last EU-SILC wave (2018) have been published.

This paper exploits these two new panels to determine the extent to which the changes in the composition of employment were behind weak wage growth in the euro area and its main member countries during the economic recovery following the global financial crisis. The level of the compositional effects thus estimated shows substantial differences compared with those in Kouvavas et al. (2019) estimated using cross-sectional data. Specifically, the level is approximately 0.4 pp to 1.3 pp lower. This means smaller positive effects during the crisis and greater negative effects during the recovery. The data used and the changes observed in the composition of employment in the euro area are presented below. Section 3 sets out the methodology employed to estimate the effects of those changes on aggregate wages. Section 4 presents the study's main findings and also analyses the contribution of each of the employment characteristics considered and of the unobservable heterogeneity component. The paper concludes by highlighting the impact of the compositional effects of employment on the relationship between euro area wage growth and the economic cycle.

3 See, for example, Andreß (2017).

4 Nevertheless, and although they used both the cross-sectional and longitudinal part of EU-SILC, they only present the results of the cross-sectional analysis, because it covers a bigger sample and, above all, longitudinal data were not available for Germany. Kouvavas et al. (2019) add that EU-SILC's longitudinal dataset includes fewer variables than the cross-sectional dataset (e.g. nationality is not included).

5 See Bartels et al. (2019). The SOEP is a longitudinal survey conducted since 1984 by Deutsches Institut für Wirtschaftsforschung (DIW) Berlin that provides information on members of around 11,000 households, including nationals from both the Federal Republic of Germany and the eastern German länder, foreigners, immigrants and refugees. The EU-SILC clone is built on the SOEP and includes all EU-SILC panel variables, for which the required information is recorded in the SOEP. Its aim is to provide an EU-SILC-like panel dataset for Germany from 2005 onwards so that Germany can be included in cross-country studies using such longitudinal data.

2 Data to study the effects of the composition of employment on euro area wage growth

The three main sources of microdata with information on employees' wages and characteristics covering euro area labour markets in a relatively cohesive and comprehensive manner are EU-SILC, the European Union Labour Force Survey (EU-LFS) and the European Union Structure of Earnings Survey (EU-SES).[6] However, only EU-SILC enables analysis of the effects of changes in individual characteristics on wages, since EU-LFS income data is only provided as national deciles. As for EU-SES, its statistics are four-yearly and refer only to workers at enterprises with at least 10 employees.

One of EU-SILC's advantages is that it provides a wide range of variables related to employees' individual characteristics (such as gender, age and educational attainment level), their job (such as employment status, occupation and professional experience) and their employer (sector and number of employees at the same workplace), with longitudinal data from 2005.[7] These data, together with those from the SOEP for Germany, make up the panel dataset upon which this paper is based.[8] Table 1 presents the main characteristics, in terms of sample size and period, of the resulting single panel for the euro area and its member countries and compares them with those corresponding to EU-SILC cross-sectional data and with the total population. The panel is somewhat smaller than the cross-sectional sample, owing above all to the data for Portugal, Finland and Ireland. For most countries the difference is less than 4% and in the case of Germany the SOEP-based panel is bigger than the cross-sectional sample.

With regard to data on wages, EU-SILC considers figures referring to the year prior to the survey. These are also presented gross, i.e. they include taxes and the employee's social security contributions, but not those of the employer. The reference variable used in this paper is real hourly wage, calculated as the HICP-deflated ratio between gross salary income and the annual number of hours worked. In turn, this number is obtained drawing on the number of months in which the individual's main activity was paid employment (full-time or part-time) and the number of weekly hours worked as an employee. The findings presented in this paper refer

6 Administrative data from social security system records are only available in some countries and do not allow for an integrated euro area-wide approach.

7 The 2005 wave included data from 2003 for Luxembourg and Norway, and from 2004 for Austria, Belgium, Estonia, Spain, Finland, France, Ireland, Italy, Sweden and Iceland. The remaining EU Member States (the latest was Germany in the 2018 wave) and other non-EU countries were gradually included, bringing the total to 32 countries.

8 A prior step is the construction of a single panel, since EU-SILC longitudinal data follow a four-yearly rotational design, such that each year 25% of the sample is renewed. The exceptions are France and Norway (with nine and eight-year rotational designs, respectively), and Luxembourg (which does not follow a rotational design). In the case of Germany, the SOEP does not follow a rotational design either (and, therefore, neither does the EU-SILC clone). Eurostat provides yearly the data corresponding to the latest observations and the preceding observations of the rotational groups retained in the sample, thereby covering up to four years. To obtain a single panel with all available information, successive longitudinal datasets were merged following the procedure described in Borst (2018). This also requires the rescaling of the individual weights enabling the new number of observations to be grossed up to the total population (see Berger and Schaffner (2015)). EU-SILC presents various types of individual weights: a base weight and others associated with two, three and four-year trajectories. In this paper, base weights adjusted for the number of hours worked were used as the individual weighting factor and sensitivity to the use of different individual weights – such as the simple average of the two, three and four-year longitudinal weights, also adjusted for the number of hours worked – was analysed. The compositional effects estimated using these new weights are broadly speaking of the same sign as those obtained using the base weights and their average size is very similar, albeit with a notably lower variability.

Table 1

PANEL DATA TO STUDY THE COMPOSITIONAL EFFECTS OF EMPLOYMENT ON EURO AREA WAGES (a)

	EU-SILC longitudinal data and SOEP (EU-SILC clone)				Memorandum items: EU-SILC cross-sectional data			Memorandum items: National Accounts (2004-2018)	
	Sample period	Number of observations	Hours worked (000s)	Real hourly wage, in euro (b)	Sample period	Number of observations	Population (2004-2018)	Hours worked (000s) (c)	Real hourly wage, in euro
Euro area (d)	**2004-2017**	**294,181**	**178,487**	**14.9**	**2005-2018**	**322,797**	**334,792,416**	**193,563,274**	**19.7**
Euro area (e)	**2015-2018**	**320,779**	**197,309**	**15.9**					
Germany (d)	2005-2017	28,605	22,685	17.1	2005-2018	23,779	81,755,751	50,192,933	23.8
Germany (e)	2015-2018	13,519	11,540	18.9					
France	2004-2018	20,105	13,596	14.9	2004-2018	20,606	64,920,228	34,881,393	23.4
Italy	2004-2018	40,863	21,689	14.2	2004-2018	42,486	59,350,906	29,689,764	16.6
Spain	2004-2018	27,201	15,443	11.8	2004-2018	29,121	45,722,325	27,086,745	15.0
Netherlands	2005-2018	19,349	7,133	23.6	2005-2018	20,038	16,657,292	10,133,578	25.9
Greece	2006-2018	19,923	10,322	9.3	2004-2018	21,033	10,967,821	5,756,931	9.6
Belgium	2004-2018	10,812	7,168	20.5	2004-2018	11,345	10,926,139	5,456,239	27.0
Portugal	2004-2017	7,628	5,254	7.6	2004-2018	15,097	10,469,906	7,538,742	8.8
Austria	2004-2018	10,871	8,026	18.6	2004-2018	11,094	8,433,287	5,631,126	22.9
Slovakia	2005-2016	12,628	10,141	3.9	2005-2018	13,511	5,399,277	3,338,703	6.1
Finland	2004-2018	16,265	5,595	20.0	2004-2018	21,124	5,373,139	3,478,993	23.5
Ireland	2004-2018	7,827	4,261	21.5	2004-2018	10,026	4,509,587	2,865,085	22.6
Lithuania	2005-2018	10,079	6,859	3.8	2005-2018	10,472	3,084,709	2,208,983	5.1
Latvia	2005-2018	11,089	7,789	4.7	2005-2018	11,333	3,084,709	1,557,849	5.5
Slovenia	2005-2018	23,425	17,252	9.7	2005-2018	23,974	2,038,853	1,264,170	13.2
Estonia	2004-2018	11,402	8,760	5.4	2004-2018	11,634	1,332,176	1,056,127	6.4
Cyprus	2005-2018	8,993	6,552	11.8	2005-2018	9,343	812,686	576,475	12.2
Luxembourg	2003-2018	8,376	8,210	26.6	2004-2018	8,678	519,741	531,355	36.3
Malta	2006-2018	8,061	6,776	10.2	2007-2018	9,106	423,767	318,083	9.8

SOURCES: Eurostat, DIW Berlin and own calculations.

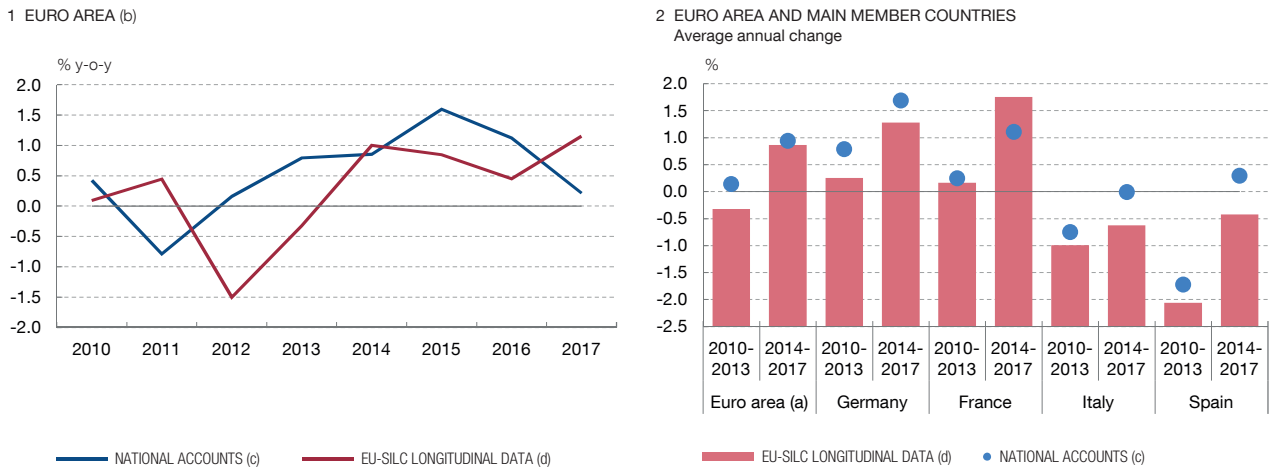
a The figures for the number of observations, hours worked, real hourly wage and population are annual averages for the corresponding period, except for hours worked and real hourly wage from EU-SILC longitudinal data in the cases of Greece, Luxembourg and Malta, which refer to the period 2009-2018, and Estonia and Ireland, which exclude 2009 and 2009-2010, respectively. Further, the figures for real hourly wage from EU-SILC longitudinal data for Italy and Latvia refer to the period 2007-2018 and for Portugal to the period 2007-2017.
b Grossed up to the population using base longitudinal weights adjusted for the number of hours worked.
c For Slovakia it is calculated by multiplying the number of employees by the number of hours worked per person in employment.
d With panel data for Germany from the SOEP (EU-SILC clone).
e With panel data for Germany from the EU-SILC longitudinal data.

to the sample including all individuals whose main activity was paid employment for at least one month in the year prior to the survey. However, restricting the sample to those employees who worked full or part-time throughout the entire year produces similar results. Further, the individual weights are also adjusted for the number of hours worked. This helps approximate developments in this variable to those according to the national accounts.

Even so, real hourly wages according to the EU-SILC panel are quite lower than those obtained from the National Accounts (see Table 1). This may be due to differences in the

Chart 1

REAL HOURLY WAGE GROWTH ACCORDING TO EU-SILC LONGITUDINAL DATA AND THE NATIONAL ACCOUNTS (a)



SOURCES: Eurostat, DIW Berlin, ECB and own calculations.

a HICP-deflated in both cases.
b Excluding Ireland in 2010, Slovakia in 2016 and 2017, and Portugal in 2017.
c Wages and salaries, divided by number of hours worked.
d Base longitudinal weights adjusted for the number of hours worked were used as the grossing-up factor. For Germany, SOEP data up to 2015 and EU-SILC longitudinal data for 2016 and 2017 were used.

target population,[9] illegal or parallel-economy activities and survey microdata measurement errors (e.g. in the imputation of values due to non-responses or temporary adjustments to the number of hours worked that the survey is unable to capture fully).[10] However, according to both sources, trends in real hourly wage growth are relatively similar (see Chart 1.1). The National Accounts show growth in that variable in the euro area of close to zero on average over the period 2010-2013 which recovered to 1% on average in the four following years. The recovery observed in EU-SILC microdata is somewhat more marked, since it started from a drop in the real hourly wage of close to 0.5% in the first sub-period. The respective recovery patterns provided by both sources for the largest euro area economies are similar to those for the euro area, albeit somewhat less marked for Italy according to EU-SILC and much more so for Spain (above all according to the National Accounts). Nevertheless, according to EU-SILC, in Italy and Spain average real hourly wage growth rates for the two sub-periods were negative (see Chart 1.2).

EU-SILC microdata, available up to 2017,[11] show important changes in the composition of paid employment in the euro area from 2009 (see Chart 2).[12] The most

9 The reference population in EU-SILC excludes certain groups that the National Accounts do include in the resident population, such as persons living in collective households and in institutions, in addition to people who have died or emigrated over the course of the year.

10 See Törmälehto (2019).

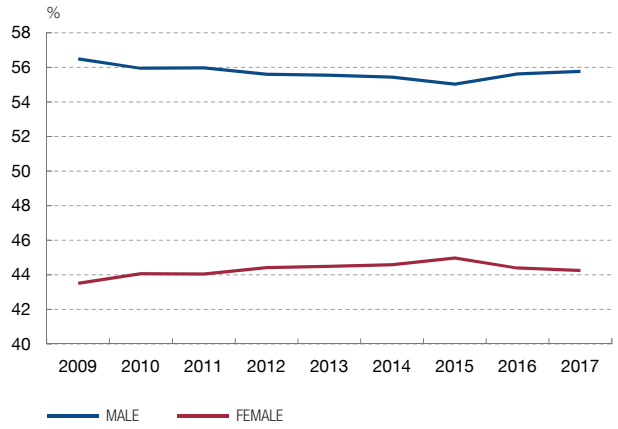
11 Based on the salary income and main activity time-reference criterion, data on individual characteristics are imputed to the year prior to the survey. Therefore, data on the personal and employment status in 2018 are imputed to 2017.

12 The initial year for analysis was selected on the basis of data availability and quality.

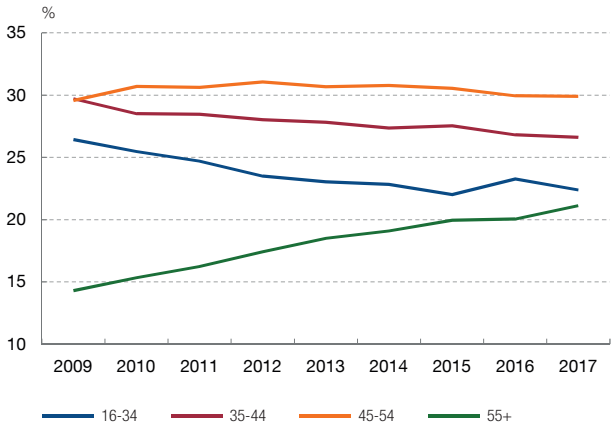
Chart 2

COMPOSITION OF PAID EMPLOYMENT IN THE EURO AREA ACCORDING TO INDIVIDUAL CHARACTERISTICS (a)

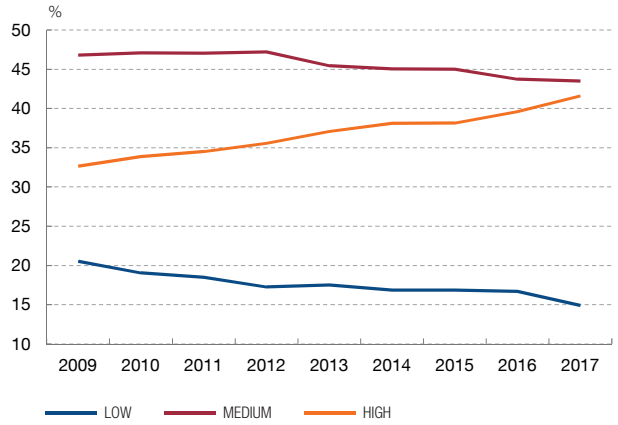
1 GENDER



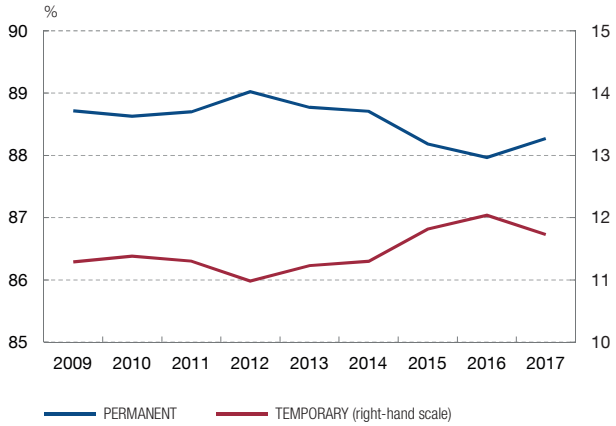
2 AGE



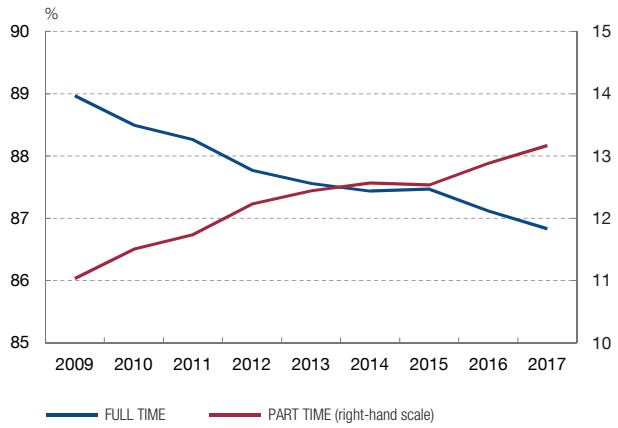
3 EDUCATIONAL ATTAINMENT LEVEL (b)



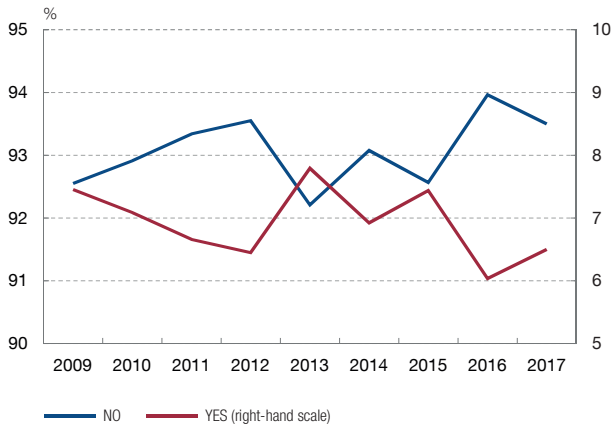
4 CONTRACT TYPE



5 TYPE OF WORKING SCHEDULE



6 DID YOU CHANGE JOBS IN THE LAST YEAR?

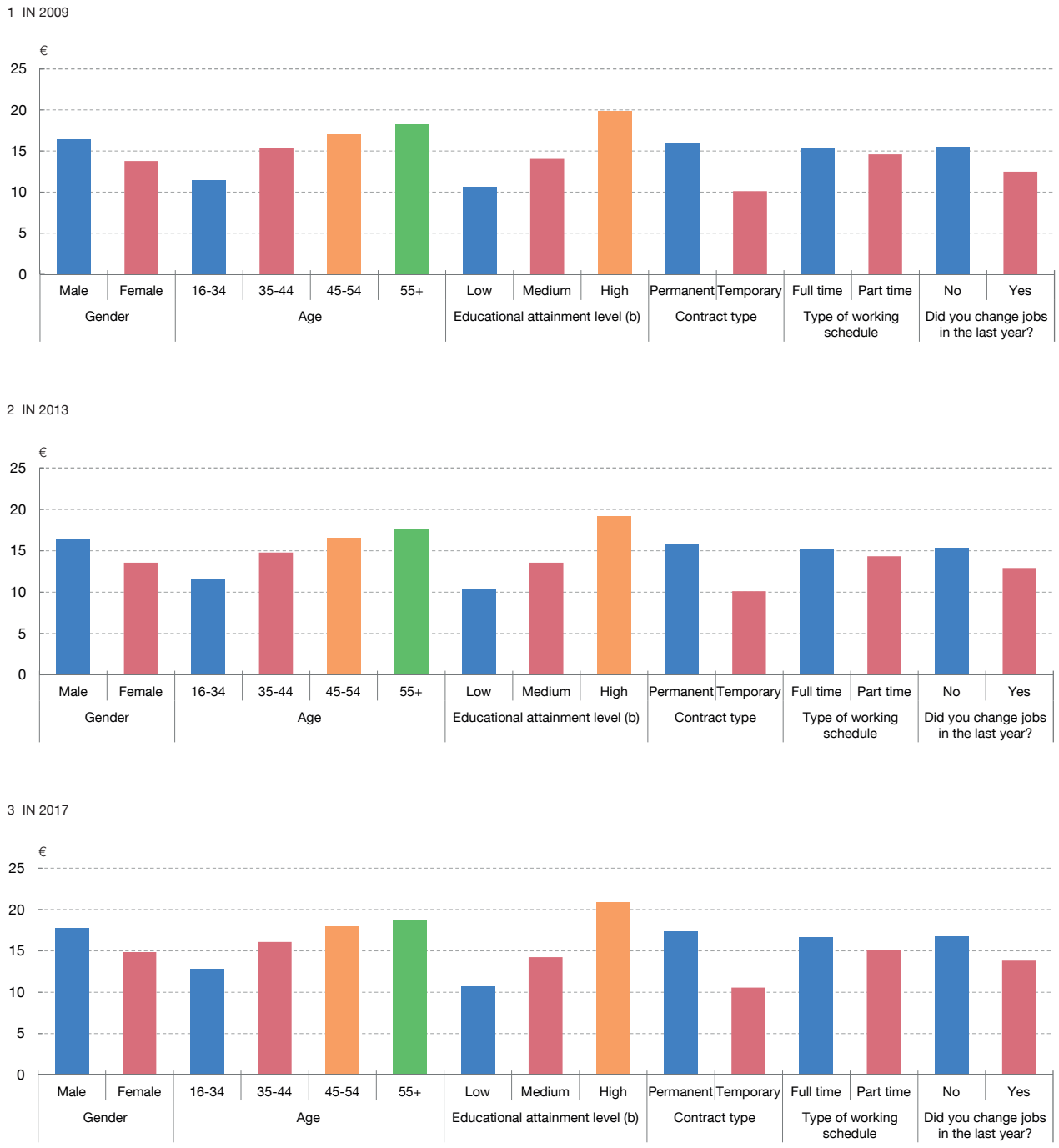


SOURCES: Eurostat, DIW Berlin and own calculations.

a Own calculations, drawing on EU-SILC longitudinal microdata, using base longitudinal weights adjusted for the number of hours worked as the grossing-up factor. For Germany, SOEP data up to 2015 and EU-SILC longitudinal data for 2016 and 2017 were used.
b Low: less than primary, primary and lower secondary education. Medium: upper secondary and post-secondary non-tertiary education. High: tertiary education (short-cycle tertiary and university education).

Chart 3

REAL HOURLY WAGE OF DIFFERENT GROUPS IN THE EURO AREA (a)



SOURCES: Eurostat, DIW Berlin and own calculations.

a Own calculations, drawing on EU-SILC longitudinal microdata, using base longitudinal weights adjusted for the number of hours worked as the grossing-up factor. For Germany, SOEP data for 2009 and 2013 and EU-SILC longitudinal data for 2017 were used.
b Low: less than primary, primary and lower secondary education. Medium: upper secondary and post-secondary non-tertiary education. High: tertiary education (short-cycle tertiary and university education).

significant are the increase in the share of older, more highly educated workers and the decrease in the share of younger, lower-skilled workers. These changes can be partly attributed to trend developments, such as population ageing, pension system reforms and the entry into the labour market of younger workers with a higher level of educational attainment than that of the generations which have stopped working. However, they may also have a cyclical component, since younger and less educated/skilled workers were the first to lose their jobs during the crisis, further increasing the share of older and more highly educated employees, albeit at a slower pace as the recovery process unfolded. This cyclical pattern is also observed in the temporary employment ratio and in the percentage of workers who changed jobs in the last year, which can be used as proxies for tenure. Both declined during the crisis and rose during the first years of the economic recovery.

Given the considerable wage differences across the various groups of workers, these changes in the composition of employment give rise to compositional effects on wage growth. Comparing by age group, the average wage of workers aged over 44 years is around 30% higher than that of workers aged under 35 years (see Chart 3). The differences are greater still when comparing by educational attainment level: the average wage of highly educated employees practically doubled that of the lowest skilled workers in 2017. Employees with a permanent contract receive an average wage almost 40% higher than those with a temporary contract. Lastly, the differences observed when comparing by gender and by the tenure proxy variable exceed 15%, while they are lower depending on whether the individual is a part-time or full-time employee. As a result of these wage differences, the increase (decrease) in the share of older (younger) and highly (less) educated workers between 2009 and 2017 appears to have contributed to aggregate wage growth in that period, while the relative increase in female employment and temporary and part-time contracts appears to have exerted downward pressure on the aggregate wage. It is therefore necessary to assess the aforementioned compositional effects using the methodology set out below.

3 Methodology for estimating the compositional effects with panel data

The methodology employed in this paper is the one used by Verdugo (2016) and Christodoulopoulou and Kouvavas (2019). This type of analysis starts with the following wage regression (ω):

$$\omega_{ikt} = X'_{it}\beta + \alpha + \gamma_{kt} + \varepsilon_{ikt} \qquad [1]$$

where i is the individual, k the country, t the year, X_{it} is a vector of individual observable characteristics,[13] α_i represents the individual fixed effects and γ_{kt} are country-year specific dummies that capture the wage component which does not depend on compositional effects. Thus, the change in wages net of compositional effects between two consecutive years ($\triangle\hat{\gamma}_{kt}$) can be estimated. The compositional effect can be obtained as the difference between aggregate wage growth and this estimated change.

In this paper, this methodology is applied, first, to the single panel dataset that includes SOEP data for Germany, in order to estimate the compositional effects until 2015 inclusive, and, second, to the single panel that includes EU-SILC longitudinal data for Germany (from 2015), in order to estimate the effects in 2016 and 2017. Additionally, the contribution of individual fixed effects to the compositional effect is broken down into four components:

1 That due to employment inflows from other economic situations, such as unemployment or economic inactivity:[14]

$$\left(\frac{\hat{\alpha}_i^{e_t}}{\hat{\alpha}_i^{t-1}} - 1\right) * 100 * e_t$$

where $\hat{\alpha}_i^{e_t}$ is the average fixed effect for individuals entering employment in year t, $\hat{\alpha}_i^{t-1}$ is the average individual fixed effect for year t-1, and e_t is the percentage of individuals entering employment in year t.

2 That due to outflows from employment to other situations:

$$\left(1 - \frac{\hat{\alpha}_i^{s_t}}{\hat{\alpha}_i^{t-1}}\right) * 100 * s_t$$

13 In this paper, the baseline specification includes the educational attainment level, age, gender, contract type and a dummy that takes the value 1 if the individual changed jobs in the last year. Different specifications of the observable characteristics vector (X_{it} in equation [1]) have been used as robustness checks, replacing the educational attainment level with occupation as a skills indicator, or eliminating the ratio of temporary to total employment and the proxy variable for job tenure. In both cases, the resulting pattern of the sign and scale of the compositional effects is consistent with that obtained using the baseline specification. Additionally, interactions between pairs of X_{it}-vector variables have been added to the baseline specification, with similar results. A possible continuation of this paper would be to use a semiparametric specification taking into account all the possible interactions between these variables.

14 EU-SILC cross-sectional data can identify individuals who have changed jobs, but not transitions between employment and other economic situations. Furthermore, as it is an annual survey, EU-SILC does not reflect all the flows that take place over the course of the year, but only those which occur between two consecutive years.

where $\hat{\alpha}_i^{s_t}$ and s_t have similar meanings to those above, but for individuals exiting employment in year t.

3 Sample inflows and outflows owing to EU-SILC's rotational design and to attrition, i.e. the loss of observations due to non-response in the years after entering the panel, which may prevent the follow-up of a significant share of the sample. The effects of attrition are notable in the German SOEP, which does not have a rotational design, and in the case of France, where rotation takes place after nine years on the panel.

4 Other changes in the average individual fixed effect, owing chiefly to changes in each individual's weighting.

The last two components cannot be considered genuine compositional effects, as they are more the result of purely statistical factors than of changes in the composition of employment. Therefore, they are excluded from the calculation of compositional effects. Only Components 1 and 2 — which can only be estimated from EU-SILC drawing on longitudinal data, as cross-sectional data can identify those individuals who have changed jobs, but not transitions between employment and other economic situations — are included.

4 Assessment of compositional effects in the euro area and its main countries

The results of the estimation for the euro area[15] indicate that the compositional effects of employment hardly affected aggregate hourly earnings in 2010 and 2011 and cushioned somewhat (0.3 pp) the fall in wages that EU-SILC shows for 2012 (see Charts 1.1 and 4.1). However, as from 2013, the sign of these effects became negative, deepening further declines in wages recorded that year and slowing down their recovery as from 2014. Notably, in 2016, the above-mentioned compositional effects deducted 1.2 pp from the increase in aggregate wages.

During the crisis years, the positive effect on the average wage of changes in employment in terms of its individual observable characteristics (particularly the educational attainment level) exceeded the negative effect associated with net employment inflows (see Chart 4.1). As discussed in Section 2, the educational attainment level is the individual characteristic linked to the biggest differences in wages across the various groups and, together with age, the one having the greatest impact on the composition of employment during this period. The negative effect of net employment inflows could be associated with firms' entry-level wages being lower than the average. This negative effect is predominant from 2013 onwards, when employment began to recover, coupled with effects such as those arising from a slower increase in the average educational attainment level of employees or from the rise in temporary contracts, especially from 2015. The recovery of employment, according to EU-SILC microdata, was mainly due to a decline in outflows, while inflows remained more or less stable. Given the positive effect on aggregate wages of outflows of employees with lower-than-average individual fixed effects, this reduction in outflows was the main driver behind the heightened negative effect arising from net employment inflows from 2013 onwards (see Chart 4.2).

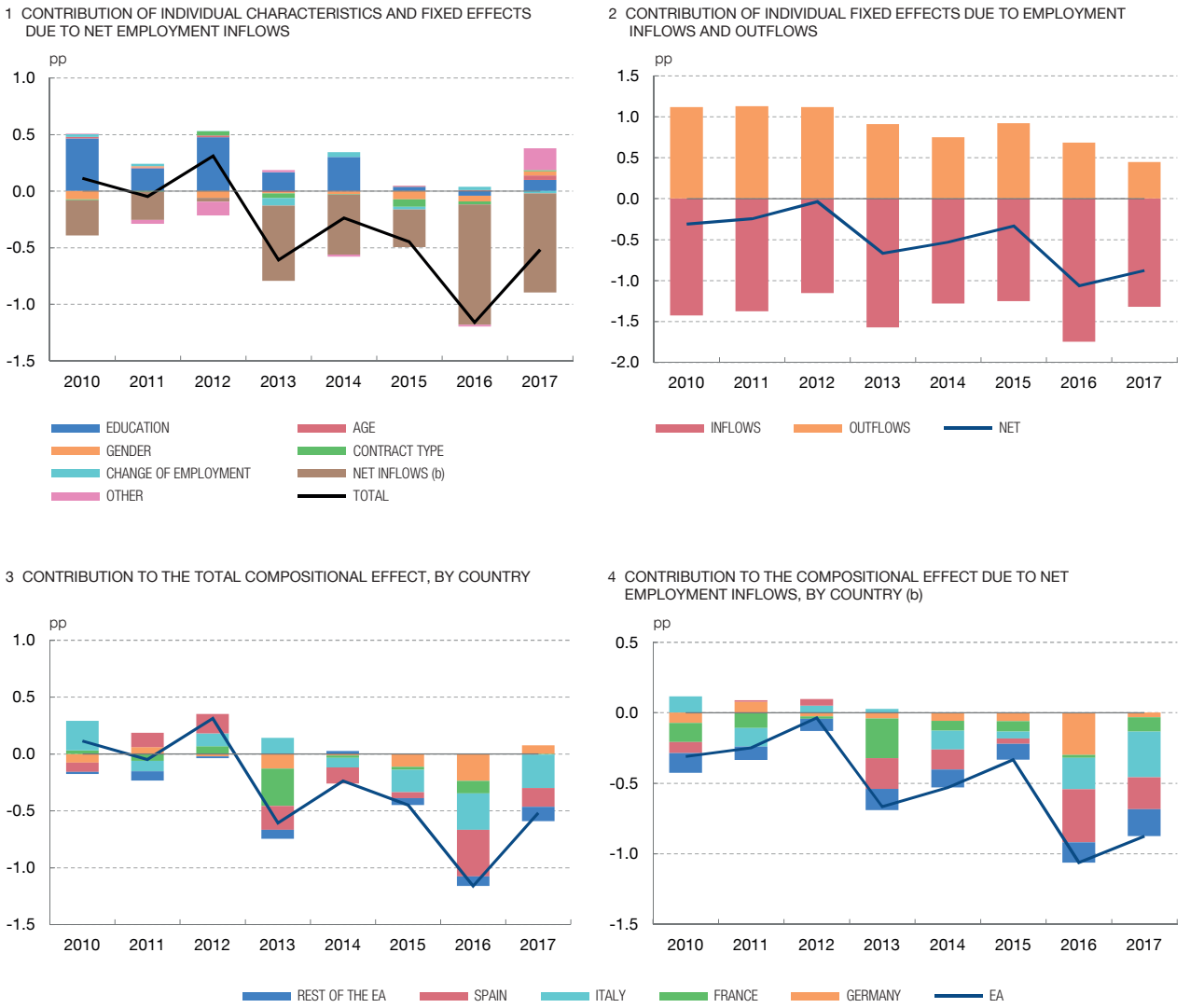
The countries which contributed most to the positive compositional effects during the crisis were Italy and Spain, along with Portugal among the smaller economies. Symmetrically, the effects dampening the recovery of wages as from 2013 originated mainly in Spain and Italy, where labour markets are more sensitive to cyclical changes (see Chart 4.3). By contrast, France and Germany only made a relatively significant contribution in 2013 and 2016, respectively. The distribution by country of the negative effect associated with net employment inflows is somewhat less uneven (see Chart 4.4). Although Italy and, especially, Spain, contributed to this effect more than the two leading euro area economies, the contribution of the Netherlands and of some smaller economies, such as Finland and Ireland, is also noteworthy.

During the crisis, positive compositional effects peaked at 1.7 pp in Italy in 2010 and 1.3 pp in Spain in 2012, in both cases as a consequence mainly of changes in the average educational attainment level of employees (see Charts 5.3 and 5.4). During the recovery, compositional effects deducted up to 2 pp from wage growth in Italy in 2016 and 2017, and up to 3 pp in Spain in 2016, mainly due to the negative effect associated

15 Country estimates have been aggregated with a weighting by hours worked.

Chart 4

COMPOSITIONAL EFFECTS ON REAL HOURLY WAGE GROWTH IN THE EURO AREA (a)



SOURCES: Eurostat, DIW Berlin and own calculations.

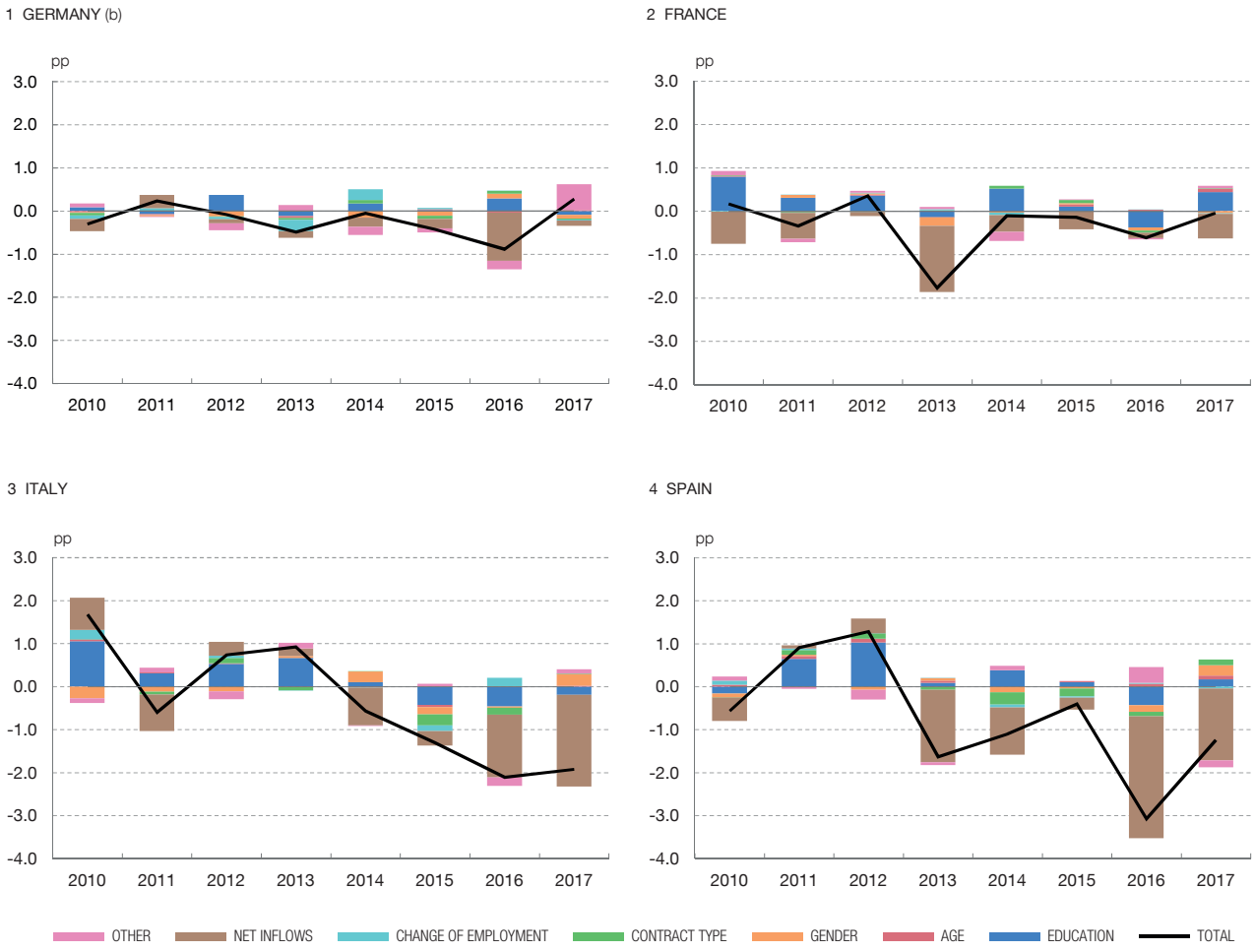
a Estimates draw on longitudinal EU-SILC data, weighting each country by its weight in the euro area in terms of hours worked according to National Accounts. Excluding Ireland in 2010, Slovakia in 2016 and 2017, and Portugal in 2017. For Germany, SOEP data up to 2015 and EU-SILC longitudinal data for 2016 and 2017 were used. Longitudinal base weights adjusted for the number of hours worked are used as the grossing-up factor.

b Contribution of fixed effects of individuals entering employment minus contribution of fixed effects of individuals exiting employment.

with net employment inflows in these countries. In Germany and France, compositional effects played a much smaller part throughout this period. In the case of the former, after a positive impact of just 0.2 pp in 2011, these effects became negative until 2016, when they reached 0.9 pp, owing mainly to the aforementioned effect of net employment inflows (see Chart 5.1). In 2017, a positive effect of 0.3 pp is estimated for Germany, probably due to unidentified characteristics in EU-SILC panel data, such as nationality, or to interactions between the variables included in the specification (represented in the charts under the

Chart 5

COMPOSITIONAL EFFECTS ON REAL HOURLY WAGE GROWTH IN THE FOUR MAIN EURO AREA COUNTRIES (a)



SOURCES: Eurostat, DIW Berlin and own calculations.

a Estimates draw on longitudinal EU-SILC, using base longitudinal weights adjusted for the number of hours worked as the grossing-up factor.
b Using SOEP data up to 2015 and EU-SILC longitudinal data for 2016 and 2017.
c Contribution of fixed effects of individuals entering employment minus contribution of fixed effects of individuals exiting employment.

heading "Other"). As for France, positive effects peaked at 0.4 pp in 2012, driven, as in Italy and Spain, by the higher average educational attainment level of employees (see Chart 5.2). In 2013, compositional effects changed sign, to an estimated -1.8 pp. This was once again a consequence of the negative impact associated with net employment inflows. Subsequently, these effects remained in negative territory, but at much lower levels.

Adjusting aggregate wage growth for compositional effects resulted in somewhat higher wage growth, on average, over the analysed period, both for the euro area and, especially, for Italy and Spain (see Chart 6.1). In these two countries, compositional effects mitigated the reduction in real hourly wages by around 0.5 pp per year between 2010 and 2012. Conversely, between 2013 and 2017, they weighed down on already subdued growth (averaging 0.5%

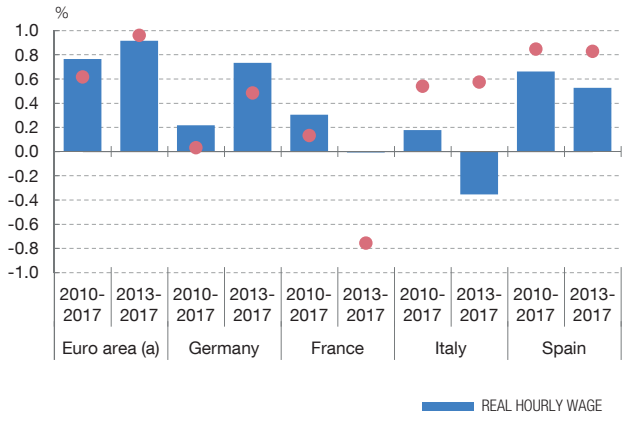
Chart 6

WAGES AND THE ECONOMIC CYCLE IN THE EURO AREA AND THE MAIN MEMBER COUNTRIES

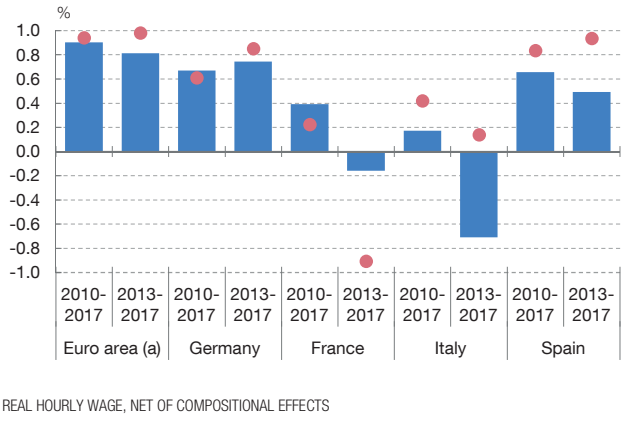
1 MAIN DESCRIPTIVE STATISTICS

		Average (%)			Standard deviation (%)		
		2010-2017	2010-2012	2013-2017	2010-2017	2010-2012	2013-2017
Real hourly wage (rate of change) (b)	Euro area	0.3	-0.3	0.6	0.9	1.0	0.6
	Germany	0.8	0.7	0.8	1.0	1.2	1.0
	France	1.0	0.0	1.5	1.4	1.8	0.8
	Italy	-0.8	-1.4	-0.5	1.6	2.2	1.3
	Spain	-1.2	-2.1	-0.7	1.4	1.4	1.3
Real hourly wage, net of compositional effects (rate of change) (b)	Euro area	0.6	-0.4	1.2	1.2	1.2	0.6
	Germany	1.0	0.7	1.1	1.0	1.0	1.1
	France	1.3	0.0	2.0	1.6	2.0	0.6
	Italy	-0.4	-2.0	0.5	1.8	1.3	1.3
	Spain	-0.5	-2.6	0.7	2.1	1.9	0.7

2 CORRELATION BETWEEN WAGES AND OUTPUT GAP (c)



3 CORRELATION BETWEEN WAGES AND NAIRU GAP (d)



REAL HOURLY WAGE REAL HOURLY WAGE, NET OF COMPOSITIONAL EFFECTS

SOURCES: Eurostat, DIW Berlin, ECB and own calculations.

a Excluding Ireland in 2010, Slovakia in 2016 and 2017, and Portugal in 2017.
b EU-SILC longitudinal data, using base longitudinal weights adjusted for the number of hours worked as the grossing-up factor. For Germany, SOEP data up to 2015 and EU-SILC longitudinal data for 2016 and 2017 were used.Compositional effects were estimated from a vector of observable characteristics which includes the educational attainment level, age, gender, contract type and a dummy that takes the value 1 if the individual changed jobs in the last year, and from individual fixed effects adjusted for changes in the sample.
c Wages: rates of change. Output gap: difference between the observed and the potential GDP, as a percentage of the potential GDP (changes in pp).
d Wages: rates of change. NAIRU gap: difference between the unemployment rate observed and the NAIRU (changes in pp).

in Italy and 0.7% in Spain), reversing it to -0.5% and -0.7% respectively. Additionally, wage growth adjusted for compositional effects showed greater volatility over the entire period, both in the euro area and in France, Italy and, especially, Spain. In the euro area, such an adjustment increases the correlation between wages and the economic cycle, especially when the latter is measured by the unemployment rate and during the recovery phase (see Charts 6.2 and 6.3). By country, this greater correlation between wages adjusted for compositional effects and the economic cycle is observed for Italy and Spain (in all cases), as well as for Germany (during the recovery phase, with the cycle as measured by the unemployment rate).

Conclusion

This paper shows that the composition of employment in the euro area underwent significant changes since the onset of the financial crisis, especially in terms of the age and educational attainment level of employees, as well as the use of temporary contracts. The sectoral composition of employment and the share of employees working in the higher and lower-paying sectors of the economy has also changed substantially. As a whole, these changes in the composition of employment have had considerable effects on euro area aggregate wage growth. In line with evidence from previous papers, these compositional effects are strongly influenced by the cyclical position of the economy and have weakened wage growth during upturns. In fact, adjusting wage growth for compositional effects results in somewhat higher wage growth, on average, over the analysed period, and in greater volatility. These effects differ in scale across economies. They have been especially significant in Italy and Spain, where labour markets are particularly sensitive to changes in the cyclical position. Both in these countries and in the euro area, adjusting wage growth for compositional effects increases the correlation between it and the economic cycle, above all when the latter is measured by the unemployment rate and during the recovery phase.

This evidence highlights the need to consider the impact of compositional effects when assessing the relationship between wages and unemployment rate or the presence of inflationary pressures from wages. Such consideration depends largely on statistical microdata being available sooner. Taking this impact into consideration could be especially relevant in the presence of profound changes in labour market conditions, such as those currently on the horizon as a consequence of the health crisis caused by COVID-19.

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